design of pavement according to said Portland Cement Association Engineering Bulletin. Any of these three values of modulus of rupture of concrete (MR) can be used for fatigue analysis of claimed pavement of the certain stress ratio factor, if strength safety of pavement designed with the use of this value of modulus of rupture (MR) corresponds to preset strength safety level. Fatigue analysis of claimed pavements with the consecutive use of three and even two value of modulus of rupture (MR) allows obtaining the more exact estimation of fatigue strength of pavement and corresponding reduction of thickness of this pavement. Results of fatigue and erosion analyses of pavement with the trial thickness should meet requirements of said Engineering Bulletin.

The essence of present invention is in the more complete utilization of flexural strength of concrete, which is underestimated as a random value in the world building practice. It is applied to current thickness design procedure provided according to said Portland Cement Association Engineering Bulletin and can be applied to new thickness design procedure with the changed fatigue and/or erosion analysis of pavement.

Furthermore, consideration of the statistical connections between flexural and compressive concrete strength allows to choose the value of modulus of rupture (MR) required by the thickness design of this pavement according to said Portland Cement Association Engineering Bulletin in connection with the corresponding value of specified compressive strength of this concrete f_c'. It allows to provide mix design of concrete determined by this value of modulus of rupture (MR) by means of corresponding value of specified compressive strength of this concrete f_c'. Design of concrete composition by means of commonly used and well-studied compressive strength of concrete is more convenient as compared with that for flexural strength of concrete.

ABSTRACT

Concrete pavement of highways and streets of uninterrupted traffic flow and high volumes of truck traffic, concrete pavement of highways and arterial streets with moderate volumes of truck traffic, and concrete pavement of roads, residential streets and other streets with small volumes of truck traffic are designed with the preset strength safety levels corresponding to values of strength safety index β equal at least about to 3.0, 2.5 and 2.0, respectively. Stress ratio factor of claimed pavement of highways and streets of uninterrupted traffic flow and high volumes of truck traffic does not exceed 0.5. Stress ratio factor of other claimed pavements can exceed this value.

Thickness of claimed pavements is controlled by results of fatigue analysis. This thickness is less by 8-10% than that provided by the thickness design of these pavements according to said Engineering Bulletin of Portland Cement Association (Thickness Design for Concrete Highway and Street Pavement, Portland Cement Association, EB109P). It is achieved due to more complete utilization of flexural strength of concrete than that provided by the current Portland Cement Association design practice of utilization of this strength. Mix design of concrete of each claimed pavement is determined by the value of modulus of rupture (MR) required by the thickness design of this pavement according to said Engineering Bulletin, concrete strength being considered as a random value. More complete utilization of flexural strength of concrete is based on the results of statistical investigation of flexural strength of concrete in connection with the compressive strength of this concrete. This investigation was carried out by the processing data of American test results of concrete strength.

Fatigue analysis of pavement is carried out in framework of said Portland Cement Association Engineering Bulletin by the consecutive use of three values of modulus of rupture (MR) with the difference of 50 psi considered as corresponding to one value of specified compressive strength of this concrete f_c'. The least of these three is the value of modulus of rupture (MR) required by thickness